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Biological Bases for Waterfowl Hunting Regulations in the Central Provinces of the European Part of the USSR

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(Bibliographical Reference: Teplov, V.P., and N.N. Kartashev. Biologicheskiye osnovy uporyadocheniya okhoty na vodoplavayushchikh ptits v tsentral'nykh oblastyakh yevropeyskoy chasti SSSR. In Zoologicheskiy Zhurnal, vol. XXXV, No. 1, 1956.)

(Translation by Dr. J.M. MacLennan, Canadian Wildlife Service.)

Introduction

Material for the present work was collected in 1953 and 1954, within the Okski state preserve and in hunting areas adjacent thereto. The observations covered: the valley of the Oka river in Izhevsk and Yerakhtursk districts of Ryazan province, the valley of the Pra river in part of its lower course (for approximately 40 km. from its mouth), and a number of non-valley lakes in the Okski preserve (Yerus, Ukhanskoye, Tatarskoye, Kalnoye, Svyatoye-Poluninskoye, etc.).

Besides the authors, the following took part in collecting material on waterfowl: scientific workers of the preserve, the Moscow University post-graduate student I.S. Turoff, and student-workers and observers on the staff of the preserve. V.N. Karpovitch, A.F. Alekseyeff, and N.V. Kokshayski participated most actively in our work, for which we here express our gratitude. (Waterfowl covered by the present study include river ducks, pochards, geese, and mergansers.)

In our work we used records of observations of more than 32,000 waterfowl, reports on the species of 356 waterfowl taken by hunters, and the results of laboratory examination of 210 ducks. Besides, over a period of years the preserve has live-trapped and banded more than 700 ducks, reports on some of which we have also used in our work.

In addition, we examined, and used as far as possible, all data on banding of ducks kept in the Banding Bureau of the Chief Directorate of Preserves and Game Management of the USSR Ministry of Agriculture.

In view of the close relation between natural conditions and waterfowl-hunting methods, we believe that our suggestions

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and conclusions can be applied not only in Ryazan province but also in all the other central provinces of the European part of the USSR.

Species of waterfowl in the Okski preserve

In the area covered by our observations sixteen species of waterfowl have been recorded: (1) Whooper swan (*Cygnus cygnus* L.); Grey lag goose (*Anser anser* L.); (3) White-fronted goose (*A. albifrons* Scop.); (4) Bean goose (*A. fabalis* Lath.); (5) Mallard (*Anas platyrhynchos* L.); (6) Gadwall (*A. strepera* L.); (7) Wigeon (*A. penelope* L.); (8) Pintail (*A. acuta* L.); (9) Common teal (*A. crecca* L.); (10) Garganey (*A. querquedula* L.); (11) Shoveler (*A. clypeata* L.); (12) Goldeneye (*Bucephala clangula* L.); (13) Pochard (*Aythya ferina* L.); (14) Tufted duck (*Aythya fuligula* L.); (15) Scaup (*Aythya marila* L.); (16) Smew (*Mergus albellus* L.)

Of the above species only seven -- ducks of the genus *Anas* (except wigeon) and pochard -- nest in the area every year.

The proportions of the several waterfowl species in different seasons, both in the wild and in the kill by local hunters, are given in Table I.

Some indication of the abundance of waterfowl at different seasons of the year is given by the comparative figures presented in Table II.

In spring geese and wigeon are most numerous in our district: occurrences of them constitute 80% of all waterfowl occurrences. In hunters' kill at that season mallards and teal (common teal and garganey) predominate, together accounting for over 90% of all birds killed. Mallards and teal also predominate in our district during the nesting and moulting periods: at that time they represent almost 93% of all waterfowl observed. During autumn migration mallards (79.3%) occur most frequently. That species also takes first place in the autumn hunters' kill (68.2%). A characteristic feature of the waterfowl population of the Okski preserve at all seasons is the preponderance of vegetarian and omnivorous species over carnivorous species, due, in all probability, primarily to the low transparency of the waters, and also in part to the relative poverty of the waters with regard to animal food.

Summary of waterfowl-hunting seasons and methods

In our district waterfowl are hunted in both spring and autumn. In spring hunting is generally permitted from the

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Table I

No.	Species	Percentages				
		Spring (Apr. 1 to May 10) (14,900 birds)	Summer (June 1 to Aug. 31) (3,250 birds)	Autumn (Aug. 15 to Nov. 1) (14,100 birds)	Spring kill by hunters (183 birds)	Autumn kill by hunters (173 birds)
1	Mallard	7.2	50.1	79.3	65.0	68.2
2	Common teal	2.0	13.2	6.8	10.9	13.8
3	Garganey	5.9	29.5	3.1	16.4	13.3
4	Pintail	1.1	2.8	0.4	1.6	0.6
5	Shoveler	0.3	2.8	0.4	0.6	-
6	Gadwall	0.2	0.9	0.6	2.2	1.7
7	Wigeon	22.4	-	0.6	0.6	0.6
8	Tufted duck	0.6	0.2	1.6	-	1.2
9	Scaup	0.3	-	-	-	-
10	Pochard	1.3	0.5	0.3	-	0.6
11	Goldeneye	0.2	-	0.8	-	-
12	Smew	0.1	-	0.1	-	-
13	White-fronted goose	48.2	-	[illegible]	2.7	-
14	Geese (grey lag and bean)	10.1	-	6.0	-	-
15	Whooper swan	0.1	-	-	-	-

TABLE II

No.	Species	Maximum no. seen in one day during		
		Spring Migration	Nesting and Moult	Autumn Migration
1	Mallard	40	150	1,000
2	Common teal	15	100	200
3	Garganey	120	100	200
4	Pintail	50	20	50
5	Shoveler	14	20	50
6	Gadwall	10	20	50
7	Wigeon	1,300	-	60
8	Tufted duck	50	1	150
9	Scaup	40	-	-
10	Pochard	70	20	50
11	Goldeneye	13	-	70
12	Smew	2	-	5
13	White-fronted goose	1,000	-	?
14	Geese (grey lag and bean)	200	-	150
15	Whooper swan	7	-	-

date of arrival of ducks (i.e. the beginning of April) until May 2 to 5 -- more than 30 days. In spring hunters are permitted to take the males of ducks of all species, and also of migrating geese. The most widespread method of taking waterfowl in spring in our district is the shooting of mallard drakes as they approach decoys. Less common is the shooting of geese from blinds during their morning and evening flights. The other species of waterfowl are seldom taken in spring, as a general rule being shot only occasionally during mallard-hunting. Decoy-shooting of wigeon and pochard is not practised.

Autumn waterfowl-hunting is usually permitted in our district from August 1 (in 1954 only, it opened on August 15) and continues until departure of the birds, i.e. until the beginning of November or the second half of that month, a total of 92 to 107 days.

In autumn in our district river ducks are taken almost exclusively (see Table I): in August mainly by shooting young birds in broods, and in other autumn months mostly by shooting birds on their morning and evening flights.

Among wildfowl shot by local hunters ducks take first place. Up to the present it has not been uncommon for a single hunter to take 15 to 25 drakes in the spring and 50 or more birds in the autumn season.

In the districts surrounding Okski preserve there are no sanctuaries. Their function is fulfilled by the territory of the preserve, on whose lakes a large duck population (numbering several thousands) nests in summer and remains in autumn. For example, in Markino marsh in section 159, with an area of about 50 hectares (125 acres), there are in favourable years 40 to 50 broods of various duck species; on Pilki Lake, with an area of about 2 hectares (5 acres), up to 500 mallards may be found in the second half of August and in September; and in Yerus Lake, with an area of 30 hectares (75 acres), more than 1,000 ducks often congregate in September and October. Considering that the total area of lakes in Okski preserve is about 350 hectares (875 acres) and the area of marshes 3,000 hectares (7,500 acres), we may conclude that the preserve indubitably has a positive effect in preserving waterfowl stocks in adjacent hunting areas.

The basis of primary
measures for regulating hunting

We consider it possible to permit spring hunting, with necessary restrictions on seasons and methods in favour of conservation and reproduction of game birds. Spring shooting must be so carried on that a minimum of harm is caused to nesting birds.

The mallard must be considered the most abundant species of waterfowl nesting in our district. That species, as we have seen, also preponderates among waterfowl killed by hunters in spring.

Mallards arrive early in spring -- at the end of March or the beginning of April. The average date of first appearance of mallards for the past seventeen years has been April 1, with limits of March 13 and April 13. Local ducks appear first, having formed pairs in their wintering quarters. For the first 10 or 15 days after arrival the mallard pairs remain inseparable, frequently coming to decoys. Later, when egg-laying begins, the pairs separate for a considerable part of the day, and birds coming to decoys are almost exclusively drakes. At the same time (approximately at the end of the second ten days in April) a considerable number of unpaired drakes appear in the habitat. We may presume that those are birds that did not find mates in the winter quarters and that migrated later than the paired mallards. The number of such "bachelor" drakes in our district apparently somewhat exceeds the number of nesting pairs; unlike the latter, they lead a wandering life. As an illustration, in the Ageyeff mountain sector (approximately 4 sq. km. in area) officers of the preserve shot 18 mallard drakes in the spring of 1953 and 24 in the spring of 1954. At the end of the hunting season the number of drakes in that area had not perceptibly diminished, and they came to decoys as readily as at the beginning. That can be explained only by continual movement of "bachelor" drakes. The question of what that group of drakes actually consists of, however, can be finally answered only by means of banding.

The reactions of wild mallards and of other duck species to decoys in different periods of the spring season are shown in Table III, based on our observations during 73 hunting experiments in the spring of 1954.

Mallard drakes come to decoys especially readily from the third ten-day period in April onwards. Female mallards make almost no response to decoys from that time to the end of the second half of May. Out of 67 mallards coming to decoys during that period, only three -- i.e., 4.5% -- were females. We see an entirely different picture during the first two-thirds of April. Female mallards come to decoys very often then. Of 69 mallards coming to decoys during that period, 20 -- i.e., 29% -- were females. From the second half of May on, mallard drakes begin to collect in flocks before their flight to the summer moulting grounds; some of them remain in the Okski preserve district during the moult.

The great vulnerability of female mallards to hunters in early April is also shown by a ten-day-period analysis of sex ratios of banded ducks taken in spring in the central zone of the European part of the USSR (Table IV).

TABLE III

	Five-day periods during							
	April					May		
	II	III	IV	V	VI	I	II	III
% of females among mallards coming to decoys	43.0	40.0	13.0	0	10.0	0	0	0
No. of mallard drakes coming to decoys, per 10 hours of hunting...	5.5	3.2	5.7	8.6	9.5	6.7	7.2	12.7
Corresponding no. of drakes of other species	0	0.7	0.7	0	0.4	2.9	7.7	18.2
Duration of hunting experiment in hours	23.5	28.0	47.5	10.5	28.5	10.5	19.5	5.5
Total no. of mallards coming to decoys throughout the experiment	23	15	31	9	30	7	14	7
Corresponding no. of other duck species	-	3	5	-	2	6	26	15

TABLE IV

	No. and sex of birds taken in ten-day periods												% F during season
	April									May			
	I			II			III			I			
	M	F	% F	M	F	% F	M	F	% F	M	F	% F	
Mallards	10	3	23	35	1	3	36	1	3	28	2	7	6
Other ducks (pintail, teal, gadwall, wigeon, shoveler)	19	3	14	49	5	9	52	10	16	44	7	14	13

Females of other species of river ducks are taken twice as often as mallard females, evidently as a result of shooting into migrating flocks. One must take into account the fact that the ratio of females among ducks taken in spring, as shown in Table IV, is certainly below the actual ratio, because of failure by hunters to return some of the bands taken from females, shooting of which in spring is prohibited in all areas, and also because of the preponderance of males among banded ducks (as explained in detail below).

From the above we may conclude that the best period for spring shooting of mallards in our local conditions is the period from April 20 to May 10. That period is also appropriate for the taking of other species of waterfowl.

The latter conclusion is based on fluctuations in the proportions of waterfowl species in different periods of the spring in the Okski preserve district (Table V). The table gives the numbers of birds of different species as percentages of the total number of all waterfowl recorded in a given ten-day period.

TABLE V

Species	April			May		
	Ten-day periods					
	I	II	III	I	II	III
Mallard	62.6	30.1	3.4	2.9	30.0	22.3
Common teal	-	7.6	2.3	2.3	13.7	4.5
Garganey	-	8.7	7.0	4.6	18.0	61.7
Shoveler	-	1.7	0.6	0.2	7.3	5.5
Pintail	23.4	1.5	0.8	0.3	1.4	2.8
Gadwall	-	-	0.1	-	-	0.6
Wigeon	11.0	8.5	15.1	36.1	8.6	-
Goldeneye	3.0	-	0.1	0.1	-	0.9
Pochard	-	-	0.5	2.0	1.0	1.4
Smew	-	-	0.1	-	-	-
Geese (bean and grey lag)	-	21.6	1.2	0.1	-	-
White-fronted goose	-	20.3	63.8	51.4	20.0	0.3
Total no. recorded*	137	427	4,100	5,500	235	640

*In 1954, when we collected material for Table V, tufted ducks, scaup, and whooper swans were not recorded at all in the Okski preserve district.

The majority of migrating waterfowl (wigeon, pochards, geese) pass through our district in the last third of April and the first third of May. Wigeon and white-fronted geese remain in large numbers in meadows appearing above the water, and live there until mid-May. The closure of spring shooting on May 2 to 5, as is now customary in our district, practically eliminates those abundant species from the list of spring game. The same may be same of pochards, although they are relatively few in our district.

Table VI shows the numbers of waterfowl of different groups seen during spring migration, according to observations made in 1953 and 1954.

TABLE VI

Year	Month and ten-day period	No. of hours of observation	No. of birds recorded per ten hours			
			River ducks	Pochards	Geese	All waterfowl
1953	April, II	14	120	55	255	430
	" III	11	350	100	315	765
	May, I	7	570	25	285	880
1954	April, I	5	140	10	-	150
	" II	15	105	-	65	170
	" III	25	430	10	1,160	1,600
	May, I	32	725	35	545	1,305

The number of waterfowl seen during the first two-thirds of April is not great, and consists mainly of local nesting species (mallards and teal) or of species passing through our district without long stop-overs (grey lag geese, bean geese). In hunting in our district during the first two-thirds of April, mallards are taken almost exclusively. That is shown in Table VII.

Setting the spring hunting season from April 20 to May 10 would greatly reduce its effect on the population of local nesting ducks, and enable us to include in the game hunted the abundant northern species (wigeons, white-fronted geese, some of the pochards) which at present are practically not taken at all in our district.

TABLE VII

Species	April			May
	1st 10 days	2nd 10 days	3rd 10 days	1st 5 days
	No. of birds taken			
Mallards	17	36	51	15
Pintail	-	1	2	-
Shoveler	-	-	1	-
Gadwall	-	-	2	2
Wigeon	-	1	-	-
Garganey	-	1	12	17
Common teal	-	1	8	11
White-fronted geese	-	-	1	4
Total no. taken	17	40	77	49
Mallards (%)	100	90	66	31

Postponing the spring hunting season to the last ten days in April and the first ten days in May would not cause too great a decrease in the number of waterfowl taken in spring, because that portion of the spring hunting season is the most productive in the central zone of the European part of the USSR: that is shown by Table VIII, which is based on reports of the taking of banded ducks.

A necessary condition for permitting spring shooting of waterfowl in the central provinces of the European part of the USSR, in our opinion, is that it should be of a purely sporting character. Spring shooting should not be the occasion for mass slaughter. The number of birds taken by hunters at that season should be restricted, and should be closely proportionate to the stocks of waterfowl in the several districts. That presupposes, of course, considerable strengthening of active control by the corresponding organizations over spring shooting.

TABLE VIII

Species	April (10-day periods)						May (10-day periods)						Total	
	I		II		III		I		II		III			
	Banded ducks taken													
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Mallard	14	11.2	36	28.8	40	32.0	30	24.0	5	4.0	--	--	125	100.0
Common teal	7	8.2	17	20.0	25	29.4	27	31.8	9	10.6	-	-	85	100.0
Garganey	1	2.4	8	19.5	14	34.2	15	36.6	1	2.4	2	4.9	41	100.0
Shoveler	-	-	2	22.2	2	22.2	4	44.5	1	11.1	-	-	9	100.0
Pintail	14	12.7	31	28.2	33	30.0	21	19.1	9	8.2	2	1.8	110	100.0
Gadwall	1	7.2	4	28.5	3	21.4	1	7.2	5	35.7	-	-	14	100.0
Wigeon	-	-	4	30.8	5	38.4	3	23.1	1	7.7	-	-	13	100.0
Total	37	9.3	102	25.7	122	30.7	101	25.5	31	7.8	4	1.0	397	100.0

We consider the following to be indispensable conditions for the permitting of spring shooting: (1) the establishment in each province of seasonal springtime sanctuaries, covering not less than one-quarter of the area occupied by nesting ducks, and (b) intensive shooting of carrion crows in hunting areas. The latter birds, as studies in the preserve have shown, destroy large numbers of egg clutches of wild ducks and other game birds in our district. Every hunter receiving a licence to hunt in spring should be given the task of destroying two or three pairs of crows.

We must recognise that a very important feature of waterfowl conservation is suppression of duck-egg collecting, which still occurs in several places in our district. Measures imposing punishment for destruction of nests must be greatly strengthened, and preservation of game habitat (especially meadows) must be improved. At the same time extensive mass-educational work must be carried on among hunters.

Let us now consider autumn shooting. We hold that its opening date should approximate the time when an absolute majority of juvenile ducks become able to fly. The usual opening date of the autumn season in our districts -- August 1 -- does not fulfil that requirement. During June and July of 1953 and 1954, 117 duck broods were recorded in the preserve district, and the size, approximate age, and stage of plumage development of the ducklings were noted. Using those data, we determined the percentage of flightless broods of the separate duck species by August 1, i.e., by the usual opening date of autumn shooting (Table IX).

TABLE IX

No.	Species	No. of broods	Flightless broods at Aug. 1	
			No.	%
1	Mallard	56	15	27
2	Common teal	27	8	30
3	Garganey	26	9	35
4	Pintail	3	2	67
5	Shoveler	3	2	67
6	Gadwall	2	1	50
	TOTAL	117	37	32

At the beginning of August 32% of broods of all duck species were flightless; that condition was most prevalent among garganeys, pintails, shovelers and gadwalls -- species that begin nesting at later dates, mostly on the shores of valley lakes, which are usually free from spring floods not earlier than the first half of May. Among mallards and common teal, which nest earlier and frequently build their nests in the forest at a distance from lakes, flightless broods are less common at the beginning of August, but their number is still fairly large.

The later dates of "maturity" of broods of garganeys, pintails, shovelers and pochards are well illustrated by data on capture of ducks for banding. In Okski preserve the majority of ducks captured for banding are juveniles not yet able to fly. By determining the species composition of the ducks captured for banding in the last ten days of July, and comparing it with the species composition of the duck population at large, as indicated by records of observations made during the nesting season, we compiled Table X.

TABLE X

No.	Species	Birds recorded		Birds captured for banding	
		No.	%	No.	%
1	Mallard	1,630	50	70	24
2	Common teal	430	13	17	6
3	Garganey	960	30	120	42
4	Pintail	90	3	24	8
5	Shoveler	90	3	45	16
6	Pochard	15	1	12	4
	TOTAL	3,215	100	288	100

It is clearly seen that mallards and common teal occur only half as frequently among ducks captured for banding late in July -- i.e., among birds that are still flightless at the beginning of August -- as among ducks recorded during the nesting period. The opposite applies to garganeys, pintails, shovelers and pochards. Those species occur more often among captured flightless ducks than among ducks at large (the ratio is almost 1½ times as often for garganeys, almost 3 times for pintails, 5 times for shovelers, and 4 times for pochards). Evidently one reason for the scarcity of those species in our nesting areas may be the shooting of their flightless juveniles, which doubtless takes place in all years when the autumn season opens on August 1.

Data on recovery of bands from ducks (mostly adults) taken in the central zone of the European part of the USSR also confirm the fact that August shooting is most harmful to the late-nesting species of waterfowl. For instance, the percentage of females among pintails taken in August is 69, whereas it is only 48 among the earlier-nesting mallards taken in that month. In September females form a much lower percentage of birds taken of both species -- 37% and 43% respectively. As stated above, flightless broods are much more common in August among pintails than among mallards; that explains the much higher take of females of the former species: females from flightless broods are more easily bagged by hunters than females from broods that are already on the wing.

Considering the large number of flightless ducks at the beginning of August, and also the fact that ducks just beginning to fly take to flight less readily and are less wary of man (at least for the first ten days after their first flight), we must recognise the necessity of postponing the opening of the autumn season to the end of the second ten days in August.

If the autumn season opens on August 20 the possibility of shooting flightless ducks will be almost entirely eliminated, and we will also decrease the take of adult females flushed by dogs from flightless broods and so falling the first victims of hunters. The autumn season for waterfowl in our area should last as long as they are present here in numbers, i.e., to the end of October (a period of 70 days).

Besides the setting of the dates for the autumn waterfowl season, the following are considered by us to be the most urgent measures for rationalization of hunting: (a) institution of strong and active protection of game habitat during the duck nesting period, a time when frequent cases of egg-collecting and taking of flightless and moulting birds by use of dogs are known to occur, and (b) establishment of autumn game sanctuaries, including not less than one-quarter of the total waterfowl habitat. The territory of those sanctuaries should be selected with a view to including lakes suitable for use by ducks for both resting and feeding. The necessity of putting those two measures into effect, even without special preliminary studies, is obvious. In our opinion it is unnecessary to fix bag limits for ducks taken in autumn, provided that the season dates are those recommended above and that sanctuaries are established.

Necessary changes in waterfowl-banding procedure

The practical value of marking and banding animals in order to solve questions relating to the rationalization of methods of utilizing them, and as a method of making relative counts of economically-important species, is generally known. Banding of waterfowl has been carried on in the Soviet Union on a fairly wide scale, and has enabled us to answer many questions concerning their ecology, thus aiding in the organization of hunting. Thus the main directions of seasonal migrations, the wintering grounds, and the areas of mass moulting have been determined in general outline for several species of ducks; constancy in return to the same nesting places has been proved for individuals of various species; and so on.

However, the relatively small number of birds banded annually and the inadequacy of present-day distribution of important banding stations still prevent us from using banding data to the extent we consider necessary.

Let us illustrate that by examples.

The number of banded birds taken should theoretically be proportionate to the total number of birds killed. Analysis of records of the numbers of banded ducks taken in the European part of the USSR (Table XI) indicates that the maximum kill in the southern zone (the shores of the Black and Azov Seas and adjoining districts, Transcaucasia, the shores of the Caspian Sea, and the lower Volga) takes place in March; in the central zone, in April; and in the northern zone (the Karelo-Finnish SSR, Murman, and Archangel province) in May. Those data without doubt correspond to the actual state of affairs. At the same time, those data do not enable us to compare the kill in different zones, as part of the duck population in the northern and central zones of the European part of the USSR is in practice almost untouched by banding. That is why a lower place appears to be held by the northern zone in spring kill returns: only 112 banded ducks, or 14% of the total number of banded ducks taken in the whole European part of the USSR from March to May, were taken in the northern zone, against 396 (51.6%) in the central zone and 259 (33.8%) in the southern zone. That lack of comparability also applies to the intensity of autumn hunting in the several zones: from August to October 203 birds were taken in the southern zone, i.e. 37.5% of the total number of banded ducks of the above species taken during that period in the European part of the USSR (Table XI); in the central zone, 304 (54.4%); and, finally, in the north only 34 (6.3%). The peak autumn kill of banded birds in all zones occurs in August -- the month when the season opens.

According to banding data, the intensity of hunting is considerably less in autumn than in spring: from March to

TABLE XI

Month	European part of the USSR							
	Southern zone		Central zone		Northern zone		TOTAL	
	Banded ducks taken*							
	No.	%	No.	%	No.	%	No.	%
January	74	9.3	1	0.1	1	0.6	76	4.5
February	117	14.7	3	0.4	-	-	120	7.1
March	213	26.7	5	0.7	-	-	218	12.3
April	44	5.5	261	35.5	6	3.6	311	18.3
May	2	0.3	130	17.6	106	64.3	238	14.0
June	-	-	5	0.7	16	9.7	21	1.2
July	2	0.3	18	2.4	2	1.2	22	1.3
August	98	12.3	171	23.3	22	13.3	291	17.1
September	45	5.7	97	13.2	10	6.1	152	9.0
October	60	7.6	36	4.9	2	1.2	98	5.9
November	84	10.6	6	0.8	-	-	90	5.3
December	61	7.7	2	0.3	-	-	63	3.7
TOTAL	800	100.0	735	100.0	165	100.0	1,700	100.0

*Data cover six species of the sub-family Anatinae: 508 mallards, 294 common teal, 126 garganeys, 45 shovelers, 577 pintails, 96 gadwalls, and 54 wigeons.

May 767 banded ducks were taken in the European part of the USSR, and from August to October only 541. That is entirely contrary to the true state of affairs, and is a consequence of the fact that in the first summer of their lives a very small number of ducks are banded.

The impossibility of using banding data to solve a number of important problems of duck ecology, understanding of which is necessary for the planning of sport and commercial hunting (as was shown above), results from the following defects in waterfowl-banding procedure.

(1) The total number of banded ducks is inadequate for our vast territory -- only about 10,000 birds are banded annually.

(2) The limited number of large-scale bird-banding stations, located mainly at points where ducks concentrate during the moult in southern districts of the country. Thus in 1950 about 26% of the mallards, 90% of the wigeons, 96% of the gadwalls, 97% of the common teal and 99.8% of the pintails banded in the USSR were banded in the Astrakhan preserve and adjacent districts.

(3) Uneven coverage of the various species of ducks. Of the total number of all ducks banded in the USSR in 1950, 62.7% were pintails; 17.7%, common teal; 8.7%, mallards; 6.4%, garganeys; 2.2%, shovelers; 1.5%, gadwalls; and only 0.8%, wigeons.

(4) Excessive sexual disparity in banded ducks. In 1950, males accounted for 93% of mallards banded (that is, of the total number of banded birds of that species whose sex was determined), 74% of pintails, 96% of wigeons, and about 90% of common teal. That is due to the fact that the majority of the birds were banded in the district of the Astrakhan preserve, in moulting areas, where adult males predominate.

(5) Young birds of the current year are almost entirely omitted from banding operations. Of ducks banded in 1950 throughout the USSR, juveniles of the 1950 broods accounted for 36% of mallards and shovelers, 3% of gadwalls, less than 2% of common teal and only 0.05% of pintails.

For the above reasons, banding data are useless for estimating the comparative extent of spring shooting -- and especially of autumn shooting -- in the different zones. The necessity of having comparable data for planning sport and commercial hunting is obvious, and does not require further argument.

The above defects in banding organization lower the percentage indexes for females taken in spring (Table IV); prevent us from discovering the character and date of dispersal of young birds from nesting areas to different points of all topographical zones; prevent us from building up a picture of the extent of hunting kill and natural mortality of different age and sex groups in different years; etc., etc.

On the basis of the material presented above we consider it urgently necessary to increase the amount of duck banding in the southern areas of their concentration while moulting -- the Kuban marshes, the Volga delta, the lakes of the Naurzumsk and Barabinsk steppes, etc. -- and at the same time to increase sharply the amount of banding of waterfowl done in their areas of

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nesting and moulting concentration in all topographical zones of the USSR, including the north. Supplementary banding stations (with appropriate provision of material) may be established in state preserves (Okski, Darvinovski, Kandalakshski, Petchoro-Ylytchski), in preserves and stations of the Academy of Sciences of the USSR and of the several republics, and in the largest and best organized game farms (on Lake Ilmen, etc.). At those supplementary banding stations adult birds should be captured and banded in spring, summer, and autumn (which will ensure that the percentage of recoveries is increased). Mass banding of ducklings should also be organized at those points. In order to expand the work of banding young birds, it is urgently necessary to construct apparatus for wing-marking, making possible the marking of ducklings that are not yet fully grown, and to provide in sufficient quantity a wide range of marking equipment. In addition, it is necessary to work out the most effective methods of live-trapping large numbers of birds on spring and autumn migration in our local conditions. Finally, attention must be given to improvement of banding records, including correct determination of species, age, sex, etc. The public must be informed more widely of the nature of banding work, in order to increase the return of bands. Expanding the scope and improving the organization of waterfowl-banding work will permit of extensive use of banding data to improve game-management planning.

If the measures proposed in this article are put into effect in waterfowl-hunting regulations, there is no doubt that they will in coming years increase the stocks of that type of game in our hunting areas.